—"Laugh and Learn" is the title of a book of nursery lessons and nursery games, by Jennett Humphreys, with many illustrations. The union of simple instruction and amusement is happily carried out. The book will be published by Scribner & Welford.

— Under the title of "The Religious Aspect of Evolution," Dr. James McCosh's series of lectures delivered in 1887 at the Theological Seminary of the Diocese of Ohio and Kenyon College will be published by the Scribners. The chapter on "Final Cause" is entirely new.

— Professor Frederick L. Ritter of Vassar has revised and enlarged his popular history of "Music in America," and the new edition will be brought out soon by the Scribners. The author has continued to date the history of the leading musical organizations and of the opera in different cities, adding about a hundred pages to the book.

— Two new volumes of "The Uncollected Writings of Thomas De Quincey," with a preface and annotations by James Hogg, are announced by Scribner & Welford. The volumes contain many entertaining essays; "Shakespeare's Text," "How to Write English," "The Casuistry of Duelling," and "The Love-Charm," being a few of the titles.

—As a memorial of a distinguished administrator, and to further the cause of imperial federation, Mr. Stanley Lane-Poole has edited the papers of Sir George Bowen, and they will be published immediately in London and New York by Longmans, Green, & Co. In one of Sir George's earlier letters there is a pleasant glimpse of Washington society during Grant's administration.

— The "Truth Seeker Annual and Freethinkers' Almanac" for 1890 (28 Lafayette Place, New York) contains, among numerous other interesting articles, an account of the inauguration of the Bruno statue in Rome, by T. B. Wakeman; some investigations into the phenomena of Spiritualism, by E. M. Macdonald; and a history of the progress of free thought in the United States during 1889. The book is handsomely illustrated.

— Our readers will learn with interest that the Scribners will issue this month the third and fourth volumes of Henry Adams's "History of the United States." The first two volumes treated of Jefferson's first administration, — 1801 to 1805; the forthcoming two volumes relate to the great Democratic leader's second term of office, — 1805 to 1809. The new volumes are said to contain considerable new material bearing upon the Burr conspiracy and other events of the period.

— The January number of the *American Naturalist* is at hand. It contains, beside another instalment of E. L. Sturtevant's treatise on the "History of Garden Vegetables," an illustrated article by J. W. Fewkes, on the habit of certain sea-urchins of boring holes in the rocks to which they are attached, and a suggestive article by R. E. C. Stearns on "The Effects of Musical Sounds upon Animals." We note the fact that this number appears almost on time; and as the present publishers, the Messrs. Ferris Brothers, of Sixth and Arch Streets, Philadelphia, have been sending out the numbers at the rate of two a month since they assumed control, it is only fair to infer that the magazine will henceforth appear on its nominal date. There are still three numbers to be furnished of the year 1889; but these will be printed and sent out as rapidly as possible, and in the mean time the current issues for 1890 will proceed with regularity.

— The Publication Agency of the Johns Hopkins University, Baltimore, has just issued "The Beginnings of American Nationality," by President Small of Colby University, commencing the series for 1890 of "Studies in Historical and Political Science;" also "The Needs of Self-Supporting Women," by Miss Clare de Graffenried of the Department of Labor, Washington, D.C., being No. 1 (for 1890) of the "Notes Supplementary to the Studies in Historical and Political Science." It is proposed, also, to collect and publish, in a limited edition, the principal literary essays and studies of Professor Gildersleeve. They will make a volume of between three hundred and four hundred pages. The following is a list of the titles of the essays: 1. "Limits of Culture;" 2. "Classics and Colleges;" 3. "University Work in America;" 4. "Grammar and Aesthetics;" 5. "Legend of Venus; 6. "Xanthippe and Socrates;" 7. "Apollonius of Tyana;" 8. "Lucian;" 9. "The Emperor Julian;" 10. "Platen's Poems:" 11. "Maximilian, Emperor of Mexico;" 12. "Occasional Addresses."

— Of the contents of *The Chautauquan* for February we note "The Politics which Made and Unmade Rome," by President C. K. Adams, LL.D.; "The Politics of Mediæval Italy," by Professor Philip Van Ness Myers, A.M.; "The Archæological Club at Rome," by James A. Harrison, LL.D., Lit.D.; "Life in Mediæval Italy," by the Rev. Alfred J. Church, M.A.; "Economic Internationalism," by Richard T. Ely, Ph.D.; "Moral Teachings of Science," by Arabella B. Buckley; "The Works of the Waves," by Professor N. S. Shaler; "Traits of Human Nature," by J. M. Buckley, LL.D; "Modern English Politics and Society," by J. Ranken Towse; "How Sickness was prevented at Johnstown," by Dr. George Groff; "Trusts and How to Deal with Them," by George Gunton; and "Divorce in the United States," by Oliver Cornell.

LETTERS TO THE EDITOR.

**** *Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

The editor will be glad to publish any queries consonant with the character of the journal.

Physical Fields.

IT seems probable that the articles which have appeared in this journal on this subject — one by A. E. Dolbear on Dec. 27, and the other by N. W. Perry on Jan. 24 — are the most important that have been recently written as bearing especially upon present theories in meteorology. It is of the utmost consequence that in this complex science we lay a sure foundation of fact, and never be tempted to speculations unless supported in the main by observations. It is not my purpose, even if I were able, to discuss the questions at issue in these papers, but I wish to present what seems to me may prove a most important field for research, hoping that others may take up the matter and shed light upon the problem.

The "thermal field" is probably the easiest to comprehend. We may conceive a white-hot cannon-ball in space. It radiates its heat equally in all directions, and is rapidly cooled. We may measure the distance to which these radiations extend. If these radiations be intercepted by any body, it in turn will be heated, and send back its radiations to the ball; and these exchanges will continue till a thermal equilibrium be established. All orthodox theories in meteorology regard the sun as a hot ball in space; that its rays impinge upon the earth, passing through the atmosphere without heating it; that this heated earth sets up convection currents in the atmosphere; and, finally, that all our winds and storms are primarily induced by these convection currents. I believe the time is not far distant when this theory will appear puerile in the extreme, and it will be acknowledged that the actions produced in any locality through the direct heat agency of the sun must be greatest just at the time when there are *no* storms, and all of them combined will not account for a hundredth part of the energy developed.

The "electric field" is the one I wish to specially notice. Mr. Perry, speaking of electrification, says, "It is a condition which is dual in its character. The negative exists because of the existence of the positive, not because of propagation from one to another. . . . We must regard electricity as motion; electrification, one kind of stress which is capable of producing electrical vibrations; magnetism may be another." Granting the existence of such a dual condition, without at present going into the question of how it can be energized or brought about, I wish to inquire what may be told or inferred as to the action of individual electrified particles in either the positive or negative portion of such a dual condition, let us say, in the atmosphere.

Take, for example, the electric arc. As I understand it, particles of carbon are continuously carried from what is called

the positive pole to the negative, and the latter is built up at the expense of the former. I do not know that the velocity of these particles has even been estimated, but it must be exceedingly small as compared with that of electricty (186,000 miles per second). Suppose we have a positive and a negative electric field, or dual condition, in a dusty atmosphere: may we not say that the dust in the positive field, if sufficiently electrified, will have a tendency to pass toward the negative field? Or, if we consider that moisture particles take the place of dust, why may not these, positively electrified, have a tendency toward the negative field? We have an illustration on a large scale in the case of thunder-clouds which have been repeatedly seen to approach each other. Mr. Dolbear writes me that he has himself noted a most remarkable and sudden clearing of clouds after a thunder-storm. I have myself observed a line of blackness gradually advance in a clear sky, the line stretching from the south-east to the north-west. The demarcation between the clear sky and the black cloud was almost geometrical in its sharpness. No rain was felt till the edge of the cloud reached the zenith; and then rain fell in torrents, though there was blue sky almost directly overhead.

But there is a still more important consideration. The difficulty of changing the moisture contents of the air is universally recognized. The number of grains per cubic foot will remain absolutely constant for days at a time, no matter what may be the heat conditions of the earth, its winds, clouds, or any other changes in the meteorological elements. A sixteen-hours' steady rain has not been sufficient to saturate the air. Nothwithstanding these facts, we now know that accompanying a storm, and independent of the sun's heat, there are most extraordinary fluctuations in the moisture contents of the air. Frequently, over an area of 160,000 square miles, this moisture may be doubled, and immediately following the storm it may be diminished three-quarters of this; and this, too, absolutely independent of the wind, pressure, or temperature. I will give but one illustration. On Dec. 22, 1889, at 3.11 P.M., I observed 4.09 grains of moisture per cubic foot in the air, which was calm at the time. At 5.2 P.M., or 111 minutes later, there were only 1.04 grains per cubic foot. This was certainly the greatest diminution I ever observed, but several times I have observed it almost as great. Without going into the questions, which this discussion must raise, it seems to me that such extraordinary changes can be abundantly accounted for on the principles enunciated in this journal, and cannot be accounted for in any other way. What we need most of all are experimental determinations showing the possibility of such transfer in electric fields. Have we any help from the difficulty of running a Holtz machine in a damp room, from the gathering of dust and lint on electrified glass rods? Is it possible to electrify a mass of air so as to test any of these questions? Thus far I have hoped only to interest others more familiar with the subject than myself. I do not expect that I have added any thing to our knowledge; but as Professor Holden has said recently, regarding photographic magnitudes of stars, "any discussion of the question at this stage can but be advantageous," so it seems to me in this field of research we may well consider that any consideration of the questions involved must tend to bring out the best thoughts of many minds; and "in the multitude of counsellors there is wisdom."

H. A. HAZEN.

Northfield, Minn., Jan. 28.

IN my communication on physical fields published in *Science* of Dec. 27, what I was most desirous of pointing out was the character of the physical re-action of a field of a given sort upon a body in it. The explanation of the various steps was unessential, entirely so; and if my explanations were not the true explanations, the conclusions reached in the main thesis would not be vitiated.

Mr. N. W. Perry takes some exceptions to my terminology, which are proper enough if I have not used appropriate terms. I most heartily agree that in all departments of science the terms used should be explicit, definite, and not misleading; but it is unfortunate indeed that all through physics, to say nothing of other sciences, there is no general agreement as to the proper use of terms. Take, for instance, the term "heat." Some say "heat is vibratory atomic or molecular motion," others just as competent say "heat is a form of energy." Now, both cannot be right, unless a mode of motion is a form of energy. Again, note the long controversy lately had in England over the proper use of the words "mass" and "weight."

The significance of it is this: that, until there is a well-settled use of a word in a technical sense, one cannot be altogether blamed if he uses the word in a sense different from some other one. Now, Mr. Perry is certain that I do not use the word "stress" properly; that it "is not proper to say that a stress travels;" that Maxwell and others do not believe that electrification involves motion in any way; that potential conditions or energy are static, and that I have made a fundamental mistake in not discriminating between static and kinetic energy.

To all this I have to reply,

1st, Suppose an electrometer to be, say, one metre from a glass rod which I electrify with a piece of silk. If the electrometer gives any indication of electrification, the condition that incites it has travelled with a finite velocity. Whether it be called a stress, a strain, or any thing else, is immaterial; whether it is a condition of the ether or action at a distance in the sense the older philosophers thought, does not matter so much if it takes time to go from the glass rod to the electrometer. One may call it potential or kinetic energy if he chooses: a static condition will presently be reached, but not instantly. And the same is true of the effect produced by magnetizing a piece of iron.

Mr. Perry seems to say, that, if there was but one body in the universe, it could not have an electric field, even if it could be electrified. If that be his meaning, I must say that his conception of electrical re-actions is totally different from mine. As Tait has it, "every action between two bodies is a stress." The body and the ether about it are two bodies; and, if they can act at all upon each other, there will then be a field. Perhaps, however, Mr. Perry calls the ether matter, which has not been my habit, and against which I was not on my guard when I wrote the statement to which he objects. Until we have some evidence that ether is subject to the law of gravitation, it seems to me to be improper to speak of it as matter. If "every particle of matter attracts every other particle of matter," and if there is no evidence that ether is so attracted, it is not conducive to good terminology to call it matter.

2d, This term "stress" has not been long in use at all, and the adoption of it into electrical science I suppose to be due chiefly to Maxwell. I have therefore looked to see how he employed it, and I find the following in his treatise on "Electricity and Magnetism," Art. 866:—

"Now, we are unable to conceive of propagation in time, except either as the flight of a material substance through space, or as *the propagation of a condition of motion or stress* in a medium already existing in space." The Italics are mine, as I interpret them to mean precisely what I meant. Evidently Maxwell did conceive that stress could travel.

Again, in Art. 863 he says, "The emitted potential *flows* to the body;" and once more, "The potential as received by the attracted body is identical with, or equal to, the potential that arrives at it;" and once more, "The velocity of transmission of the potential is not like that of light, constant relative to the ether or to space, but rather like that of a projectile, constant relative to the velocity of the emitting particle at the instant of emission."

These quotations seem to me to justify me in the use of the word "stress" as a condition capable of translation from one point to another. It is not unlikely, though, that within the past few years, and since Maxwell's death, the term has become more precise; and that, if true, would justify calling attention to a departure from such use.

A. E. DOLBEAR.

College Hill, Mass, Feb. 2.